In the Specification:

[000053] The dispersion process is normally carried out with a conventional KPG stirrer or a dispersing machine. Conventional propeller mixers with stirring speeds of between 600 and 1500 rpm are adequate for particle sizes of between 10-500 μm. Particle sizes <10 μm are normally realized by stirring speeds of >1500 rpm. On the other hand, only dispersing machines with mixing speeds of >2000 rpm are needed for particle sizes of <1 μm. All stirrers that work according to the rotor-stator principle are used for this purpose. At these high mixing speeds the experiments are preferably carried out in an argon or nitrogen atmosphere or in a vacuum to largely rule out the introduction of air that could permanently affect the dispersion quality. Prior to the dispersion process, the monomer solution may be pre-polymerized for 5-120 seconds.

[000071] The specific application of the polymer carrier in accordance with the invention in conjunction with an externally controllable structural change surprisingly opens up the possibility of exploiting new integral active combinations. These consist of using the polymer particles as a new type of contrast-intensifying medium in the context of NMR diagnostics and parallel to this as a basis for a controllable application of active agents. From the state of the art, it is known (DE-OS 3508000, US patents 5,492,814 and 4,647,447), that superparamagnetic, ferromagnetic or paramagnetic substances lead to a substantial intensification of the contrast during imaging in the context of NMR diagnostics (e.g. magnetic resonance tomography, MRT) which in turn enables a more precise diagnosis through a better localization and classification of pathological processes (e.g. detection of tumors in early stages and micro-metastases). The polymer particles

may also be used as carriers for active agents in medical therapy and diagnostics, as controllable carriers for reactants, as media to control microfluid processes, as separation media in column chromatography, as media to adjust and regulate pore sizes in membranes, as media to block blood vessels, as artificial cell carriers, as separation media for nucleic acids, cells, proteins, steroids, viruses or bacteria, in each case by using a magnetic alternating field, preferably a high-frequency magnetic alternating field.

[000088] Example 1:

10 ml of a 0.1 M Na-phosphate buffer, pH 7.2, containing 15% N-isopropylacrylamide recrystallized from n-hexane, 5% acrylamide and 0.6% N,N'-methylene bisacrylamide, as well as 2.5 ml of an aqueous magnetic colloid containing 2.2 mM Fe/ml (mean particle size 26 nm) produced in accordance with a specification from Shinkai et al., Biocatalysis, Vol. 5, 61, 1991, are mixed and exposed to ultrasound for 5 min. in an ultrasonic bath (250 W) whilst being cooled with ice. Nitrogen is then introduced into the mixture for 15 min. to remove excess oxygen. 1 ml of an aqueous solution consisting of 0.1 mg anti-p53-antibodies (Roche Molecular Biochemicals), 0.05% Human Serum Albumin, 2% inosite and 0.5% gelatine is added to this mixture. It is exposed to ultrasound for a further 30 sec. whilst being cooled with ice. The aqueous phase is then mixed with 2 ml of a 30% ammonium persulphate solution (APS) containing 0.5% Igepal 720 in the presence of nitrogen and then suspended in 150 ml trichloroethylene that has been gassed for 20 min. beforehand with nitrogen and contains 1.5% of a mixture consisting of 80% Span 85 and 20% ~~Tween~~ TWEEN® 20 (polysorbates (polyoxyethylene sorbitan esters)), in a thermal

controlled dispersing vessel (e.g., ~~Ultra-Turrax~~ ULTRA-TURRAX® LR 1000, IKA ~~Werke~~ Works, Inc.) at 4°C while being stirred (15,000 rpm). 1 ml of N,N,N',N'-tetramethylethylenediamine (TEMED) is added after 10 sec. The suspension process is continued for 5 min. with a constant supply of nitrogen and ice cooling. The dispersion is left for a further 20 min. without stirring at 10°C to polymerize. The dispersion is then placed in a glass column densely packed with steel wool (filling volume: approximately 10 ml; inside diameter: 0.5 cm) that is surrounded by a 5 cm long, ring-shaped neodymium-boron-iron-magnet and the mixture allowed to slowly (0.5 ml/min.) drip through the column. After this passage it is rinsed ten times with approximately 20 ml of Na-phosphate buffer containing 10% ethanol, 2% inosite and 1.5% polyvinyl alcohol (molecular weight, M_w: 5000). This is followed by washing five times in distilled water, and washing three times in 0.05 M Na-phosphate/1% inosite buffer, pH 7.2. The magnetic polymer fraction on the column is then eluted with 5 ml of a 0.1 M Na-phosphate buffer, pH 7.2, after removing the magnet. The eluate obtained in this way is then freeze dried. Following redispersion in 2 ml of a 0.05 Na-phosphate/0.1% Human Serum Albumin (HSA)/0.1% polyethylene glycol (PEG, M_w: 1000) buffer, pH 7.5, magnetic polymer particles with a mean particle size of 170 nm are obtained. The particles obtained are reduced in size by 43% within two minutes following treatment in a magnetic alternating field (magnetic field: 30 kA/m; 0.6 MHz, coil diameter: 5.5 cm, 8 windings).

[000090] Example 2

Cobalt-ferrite-nanoparticles ($CoFe_2O_4$) are produced according to a specification from Sato et al., J. Magn. Magn. Mat., Vol. 65, 252, 1987, from $CoCl_2$ and $FeCl_3$ and dispersed in water with the aid of a high-power ultrasonic finger (make: Dr. Hielscher, 80% amplitude) in the presence of 0.75% polyacrylic acid (M_w: 5.500) for 30 sec. 5 ml of the colloid containing 1.9 mM Fe/ml with a particle size of 21 nm are then mixed with 20 ml high-purity and degassed water in which 15% N-isopropylacrylamide, 6% acrylamide, 1% acrylic acid, 0.5% Igepal 520 and 0.8% N,N'-methylene bisacrylamide have been dissolved. The mixture is once again exposed to ultrasound for one min. with the ultrasonic finger whilst being cooled with ice and then in an ultrasonic bath for 30 min. After adding 2 ml of 40% APS, the mixture is dispersed in 300 ml of 1,1,1-trichloroethane containing 6% of a mixture of ~~Tween~~ TWEEN® 80 and Span 85 (72% : 28%) with the aid of a dispersing machine (~~Ultra-Turrax~~ ULTRA-TURRAX®, IKA ~~Werke~~ Works, Inc., 10,000 rpm) with ice cooling and the introduction of nitrogen. 1 ml of TEMED is added after 10 sec.. The dispersion process is continued for 5 min.. The reaction mixture is then left to complete the reaction for a further 20 min. at 10°C. The product is then separated and washed analogous to Example 1. After elution with 5 ml of 0.1 M Na-phosphate buffer, pH 7.4, it is dialyzed with 5 litres of a 0.01 M Na-phosphate buffer, pH 7.4, for 3 days. Magnetic particles with a mean particle size of 245 nm are obtained. 2 ml of the magnetic particle fraction obtained are placed in the magnetic separation column (cf. Example 1) and washed three times with a 0.01 M HCl solution and five times with high-purity water. After removing the magnet, 2 ml of 0.1 M 2-

morpholino-ethanesulphonic acid (MES)/0.5% PEG (M_w: 1000)-buffer, pH 4.2, are added to elute the magnetic particles on the column. 0.5 ml of a 0.1 M MES-buffer, pH 4.2, in which 0.2 mM of N-cyclohexyl-N'-(2-morpholinoethyl)-carbodiimide-methyl-p-toluene sulphonate have been dissolved, are added to the eluate. The mixture is shaken lightly for 30 min. at room temperature. A subsequent passage through the separating column filled with steel wool separates off any excess N-cyclohexyl-N'-(2-morpholinoethyl)-carbodiimide-methyl-p-toluene sulphonate and the retained magnetic particle fraction is then washed five times with 15 ml of ice water in each case. After removing the magnet it is eluted with 1.5 ml of 0.05 M MES-buffer, pH 5.5. The eluate is mixed with 0.5 ml of the same MES-buffer in which the $1.25 \cdot 10^{-4}$ mM Anti-CD30-Fab-fragments are dissolved and coupled with the antibody fragments over a period of 12 hours at 4°C. The conjugate is separated over the column filled with steel wool and rinsed ten times with 10 ml of ice cold 0.05 M Na-phosphate/1% inosit/0.1% HSA-buffer, pH 7.2 in each case. This is followed by washing five times in 0.05 M glycine-buffer, pH 10.5 and washing two times in distilled water. The magnetic fraction is eluted with 2 ml of a 0.1 M Tris/HCl buffer, pH 8.5, after removing the hand magnet. The eluate is incubated with 3 ml of Tris buffer containing 1 M glycine, pH 8.5, for 12 hours at room temperature to deactivate any remaining carbodiimide. The magnetic fraction is then separated over the magnetic column and rinsed ten times with 0.05 M phosphate buffer/0.05% HSA, pH 7.5. After successful elution of the magnetic conjugate with 2 ml of 0.05 M phosphate buffer/0.05% HSA, pH 7.5, the magnetic particles can be used in accordance with the known application methods as contrast-intensifying media in the context of NMR

diagnostics to diagnose Hodgkin's lymphoma.

[000091] Example 3

7.5 ml of a 0.1 M Na-phosphate buffer, pH 7.2, in which 20% N-isopropylacrylamide, 4% acrylamide, 1% N,N'-methylenebisacrylamide and 2.4% 2-hydroxyethyl-methacrylate have been dissolved, are rinsed for 20 min. with nitrogen and then mixed with 2.5 ml of a magnetite-ferrofluid (EMG 507, FerroTec, USA). The mixture is exposed to ultrasound in an ultrasonic bath for 5 min. whilst being cooled with ice. 2 ml of 1% gelatine and an insulin solution containing 0.1% HSA (INSUMAN® Basal, 100 IU/ml) are then added. After adding 1.2 ml of a 35% APS solution to the aqueous phase this is dispersed in 130 ml of trichloroethylene containing 2.5% Span 60 and 1% ~~Tween~~ TWEEN® 80, with stirring (1200 rpm) and constant ice cooling as well as a continuous flow of nitrogen. After 20 sec., 0.5 ml of TEMED are added and the mixture stirred for 8 min. at 10°C. The reaction mixture is then left to complete the reaction for a further 20 min. at 15°C . The magnetic phase is separated and the retained product purified analogous to Example 1. After freeze drying and repeated dispersion in 2 ml of a Na-phosphate buffer/0.1% HSA/0.5% PEG (M_w: 1000), pH 7.2, magnetic particles with a mean particle size of 23 µm are obtained. Exposure of the particles to a magnetic field (15 kA/m; 0.6 MHz, coil diameter: 5.5 cm, 8 windings) leads to a 55% shrinkage within 3 min., whereby 58% of the originally added insulin is released. The polymer carriers can be used as an insulin depot in the treatment of diabetes.